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MINERALOGY AND PETROGRAPHY.[1]

The Petrography of the Abukuma Plateau, Japan.—The northern half of the Japanese Archean area, the Abukuma Plateau, is thought by Koto[2] to consist of a series of Laurentian granites and pressure gneisses, cut by younger granites and other eruptives, and overlying these a series of schists, divided by the author into lower and upper Huronian. The Laurentian granitic are an older amphibole-biotite variety and a younger, intruding biotite granite. The former contains, in addition to the usual granite components, microcline, and a bluish-green, weakly pleochroic hornblende, that very frequently plays the *role* of an ophitic groundmass for the other constituents. This granite passes by dynamo-metamorphism into foliated phases, in which the various minerals have been compressed, and the quartz, in addition, granulated. The Huronian (?) beds are principally schists and gneisses, that differ from the Laurentian gneisses in having the plane parallel structure, i. e., they are composed of bands of different composition. The most important schists of the lower division are: gneissic mica schists, containing andalusite and sillimanite, two-mica schists, one of whose constituents is margarite, garnet-biotite schist and hornblende schist. A peculiar member of the series is a titanite amphibole schist, consisting of bands whose structure is granular. Its black bands are made up of green-hornblende, plagioclase and a little biotite, and its white ones of sphene and granular sahlite in a groundmass of altered feldspar. The upper Huronian series embraces foliated amphibolites, mica-schists, and green schists that may be tufas. The distinction between the lower and upper members of the group seems to be based mainly upon petrographical characteristics. Among the rocks cutting these various schists may be mentioned an amphibole-picrite, pegmatites, and several varieties of diorite-porphyrite.

The Leucite-Tephrite of Hussak, from New Jersey.—The eleolite syenite eruption of Beemerville, N. J., was accompanied by basic extrusions now represented by the smaller dykes associated with the large eleolite-syenite dyke in this region. One of the most interesting of the basic dykes is the one at Hamburg, Sussex Co. It is from 15 to 20 feet wide and consists of a dark, tough, biotite rock, holding spheroidal inclusions, that have been taken for Hussak[3] to be leucites. Kemp[4] has recently examined this rock very carefully, and now describes it as composed of biotite and pyroxene imbedded in an isotropic groundmass that is chiefly analcite. The biotite is dark brown and the pyroxene of a faint yellow color, with an extinction of 33°. The spheroidal inclusions are analcites, about whose ruins are often grouped grains of biotite and crystals of sphene. An analysis of one of the spheroids, after deducting 3.886 % of Ca Co_2, gave:

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[1] Edited by Dr. W. S. Bayley, Colby University, Waterville, Maine.

[2] Jour. Coll. Science, Imperial University, Japan, v, 3., p. 197.

H_2O	SiO_2	Al_2O_3	Fe_2O_3	CaO	K_2O	Na_2O
6.31	52.44	26.44	.43	1.94	3.54	8.90

As to the origin of the analcite the author is not certain. It may have been derived either from leucite, in which case the rock would be a leucite-tephrite, as considered by Hussak, or it may be alteration product of nepheline.

A Sodalite-Syenite from Montana.—In the mountains forming the northern portion of Montana, Lindgren[5] and Melville have discovered post-cretaceous quartz-porphyrites, lamprophyres, augite-trachytes, analcite basalts, and a peculiar sodalite-syenite, somewhat resembling certain rocks described by Chrustschoff from Russia. The Montana syenite is from Square Butte, situated thirty miles southeast of Fort Benton. It is a light gray eruptive, associated with sheets of theralite and analcite basalt. Macroscopically it consists of lath-shaped feldspars, prisms of hornblende and pale brown grains of sodalite. In addition, analcite and plagioclase are discoverable under the microscope. Many of the feldspar crystals are corroded in an extraordinary manner and the cavities thus formed in them are filled with analcite which is believed to be an alteration product of albite. The hornblende is very dark brown, almost opaque, with a strong pleochroism, an extinction of 13° and a density of 3.437. Its analysis indicates its identity with the variety barkevikite:[6]

H_2O	SiO_2	$Al_2O_3(TiO_2)$	Fe_2O_3	FeO	NiO	MnO	CaO	MgO	Na_2O	K_2O
.24	38.41	17.65	3.75	21.75	tr	.15	10.52	2.54	2.95	1.95

The sodalite is quite fresh. It forms irregular grains that are bounded by crystal faces when in contact with analcite. It was evidently formed after the feldspar but before the analcite. The composition of the rock as calculated from its analysis is: 23% hornblende, 50% orthoclase, 16% albite, 8% sodalite, and 3% analcite.

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[3] AMERICAN NATURALIST., March, 1893, p. 274.

[4] Amer. Journ. Sci., Apr., 1893, p. 298.

[5] Amer. Journ. Sci., June, 1893, p. 286.

[6] AMERICAN NATURALIST, June, 1890, p. 576.

The Anorthosites of Canada.—The Canadian geologists have long considered the Laurentian of northern North America as consisting of an upper and a lower division, of which the latter rests unconformably upon the former. This upper division is made up largely of basic schists to which the name Novian was given by Hunt. Adams[7] has examined all of the important occurrences of the supposed schists, and has discovered that in all cases they show an irruptive contact with the surrounding gneisses, which they evidently cut. They are thus unquestionably post-Laurentian, and, from their relations to the overlying rocks, they are thought to be pre-Cambrian. The dark rocks are anorthosites—aggregates of plagioclase, with a little pyroxene, olivine and some accessories—which are in places schistose, and in other places are connected genetically with gabbros. The schistosity of the rock is accompanied by the possession of cataclastic structure, regarded by the author as due not to dynamic processes, but to the movement of the magma just before final consolidation. The plagioclase of the rock which is by far its most prominent component, is a labradorite so filled with tiny inclusions of microlites, thought by the author to be ilmenite tables, that fragments of the mineral are dark and often show the play of colors so beautifully seen in the labradorite of Labrador. The pyroxenes are a weakly pleochroic green augite, and a strongly pleochroic hypersthene. Hornblende, biotite, quartz, garnet and zircon are also present in small quantities in all specimens of the anorthosite. In the Saguenay river occurrence, olivine is enclosed in the plagioclase, and between it and the latter mineral is a reaction rim, composed of an inner zone of hypersthene, and an outer one of actinolite, including many small, green spinels. All the occurrences of the rock in Canada are briefly described, and with them are compared similar occurrences found elsewhere.

The Melibocus "Massiv" and its Dyke Rocks.—The peak of Melibocus[8] in the Odenwald consists mainly of a medium-grained white granite to the West, and a complex of schists and gneisses to the East. The granitic constituents, orthoclase and quartz, are usually aggregates of small grains variously orientated, and the biotite shows evidence of having been subjected to pressure. Near the contact with the surrounding rocks the granite becomes gneissic, and everywhere it is cut by dykes of aplites, porphyries and lamprophyres. Where the aptites penetrate the gneisses they possess the usual characteristics of these rocks, but where they pass from the schists into the granite they become porphyritic, showing a fine grained groundmass of quartz, orthoclase and mica and numerous phenocrysts of the same minerals and garnet. Like the granite the aplite components exhibit evidences of the effect of pressure. The large crystals are granulated and the rock's structure is more or less schistose. For this aplitic rock with porphyritic crystals the author, Chelius, used the name Alsbachite. An analysis of an alsbachite from the northwest side of the mountain gave:

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[7] Neues Jahrb. f. Min., etc., B. B., viii, p. 419.

[8] C. Chelius: Notizbl. d. Ver. f. Erdk. z. Darmstadt, 1892, iv, F. 13 H., p. 1.

SiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	CaO	MgO	K_2O	Na_2O	H_2O
74.13	12.61	2.87	.86	.16	1.60	.23	2.13	4.55	.66

The dioritic aplites, malchite, luciite and orbite are also represented among these dyke rocks—the malchite being the panidiomorphic diorite aplite, the luciite the hypidiomorphic granular forms, and the orbite the corresponding porphyritic phases. One of the luciites is described as made up almost exclusively of plagioclase and hornblende. Among the lamprophyric dykes, mention is made of a gabbrophyre, or odinite, which differs from the gabbro-aplite, beerbachite, in consisting of phenocrysts of plagioclase and colorless augite in a matrix of plagioclase laths and hornblende needles, while the aplite is a panidiomorphic aggregate of diallage and feldspar, with the addition, sometimes, of hornblende crystals that enclose the other constituents. The descriptions of all these rare rocks are very brief.

The Granites of Argentina, S. A.—In an elaborate description of 185 hand specimens of stock and dyke granites and pegmatites, cutting the archean and paleozoic beds of Argentina, and of younger granites cutting these older ones, Romberg[9] discusses at some length the origin of the micropegmatitic intergrowth of quartz and feldspar. He believes that in the rocks studied by him the quartz in the intergrowths is secondary, and that it has originated in the decomposition of orthoclase and plagioclase. Many micro-photographs accompanying the author's article illustrate clearly the steps by which this conclusion was reached. Although the description of the specimens is exhaustive, it contains no points of special interest. At the conclusion of the paper is a list of the specimens examined, with their localities, and appended to it are twelve plates containing seventy-two micro-photographic reproductions of their sections.

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[9] Neues Jahrb. J. Min., etc. B. B. viii, p. 275.

New Minerals.—*Geikielite.*[10]—This mineral was found as pebbles in the gem washings near Rakwana, Ceylon. It is essentially a magnesium titanate, $MgTiO_3$, corresponding to the calcium compound, perofskite. The mineral is bluish-black and opaque, with a brilliant lustre, and possessing two cleavages at right angles to each other. Its density is 3.98 and hardness 6.5. In thin section it is translucent with a purplish-red tint, and in converged light it shows a uniaxial figure.

Baddeleyite,[10] also occurring as pebbles in the above-mentioned locality, is a black substance with a density of 6.02 and a hardness of 6.5, thus strongly resembling columbite. Under the microscope small fragments are seen to be dichroic in greenish-yellow and brown tints, and to possess a biaxial symmetry. The crystallization is thought to be monoclinic, though only a few plans could be detected on the specimen. In chemical composition the substance is zirconia ZrO_2.

Folgerite, *blueite* and *whartonite* are all nickel-iron-sulphides from the Sudbury nickel mines at Algoma, Ontario. Emmens[11] describes the first named as a massive, bronze-yellow substance, with a grayish-black streak, a density of 4.73 and hardness 3.5. Its composition ($Fe = 33.70$; $Ni = 35.20$; $S = 31.10$) corresponds to $Ni\,Fe\,S_2$.

The *blueite* is also massive. Its color 'is olive-gray or bronze; its streak black, density 4.2 and hardness 3–3.5. Its analysis yielded $Fe = 41.01$; $Ni = 3.70$; $S = 55.29$, corresponding to pyrite with a thirteenth of the Fe replaced by Ni. Unlike pyrite, however, it dissolves easily in nitric acid, without the precipitation of sulphur.

Whartonite differs from blueite in containing more Ni. Its composition is $Fe = 41.44$; $Ni = 6.27$; $S = 52.29$, corresponding to $(Fe\,Ni)\,S_2$ in which $Fe : Ni = 7 : 1$. Its hardness is 4, density 3.73, and color and streak like those of blueite.

Hauchecornite is another nickel mineral. It is described by Scheibe[12] from the Friederich mine in the Hamm mining district, Germany. It is found in bronze-yellow tetragonal crystals, with a hardness of 5, and a density of 6.4. It is thought to have the composition corresponding to the formula $Ni\,(Bi.\,Sb.\,S)$, though analysis yields discordant results.

Cuprocassiterite was described by Ulke[13] from the Etta mine, South

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[10] Fletcher: Nature, Oct. 27, 1892, p. 620.

[11] Jour. Amer. Chem. Soc., Vol. xiv, No. 7.

[12] Jahrb. A. preuss. geol. Landeranst, 1891, p. 91.

[13] Proc. Amer. Inst. Min. Engineers, Feb. 1892.

Dakota, but the author's data were so scanty that Headdon[14] has thought it advisable to add a small additional contribution to the literature of the mineral. This last-named writer obtained a small quantity of what he supposed to be Ulke's new mineral from both the Etta and Peerless mines, and found upon examination that in the interior of a small mass from the Peerless mine is a nucleus of stannite containing a little cadmium. Intergrown with this and also forming an envelope around it is a green clayey substance, which, upon its exterior, passes into a yellow earth. The green substance has a density of 3.312–3.374. Its analysis shows it to be a mixture of about 7 SnO_2, 6 CuO, 2 FeO and 11 H_2O. The author regards it is an alteration product of stannite, but not as a well-defined mineral species.

New Edition of Rosenbusch's Volume on Minerals.—The new edition of Professor Rosenbusch's[15] Microscopic Physiography of the Rock-forming Minerals is an enlargement rather than a revision of the second edition. There is no material difference in the arrangement of the matter in the two editions, but there have been large additions made in the later volume in the shape of descriptions of new petrographical apparatus and methods, and in the number of minerals treated. The plates illustrating the text have been decreased by one. The remainder are much better executed than was the case in the earlier volume.

Mineral Syntheses.—Michel[16] has obtained *melanite* garnets and *sphene* crystals by cooling slowly a mixture of 10 parts titanic iron, 10 parts calcium sulphide, 8 parts silica and 2 parts carbon, that had been heated to 1200° for five hours.

Crystallized *leucite, potassium cryolite* and *potassium nepheline* results from the fusion of silica or of fluosilicate of potassium and alumina with an excess of fluoride of potassium. Prolonged heating produces leucite, and potassium cryolite. Less prolonged treatment yields a potassium nepheline, which crystallizes in negative orthorhombic prisms.[17].

Instruments.—For measuring the curves of isotherms on mineral plates Jannetaz[18] has constructed a new ellipsometer, which it is believed will enable its user to measure accurately the axes of the isothermal ellipses, and to determine rapidly in each case whether apparently circular isotherms are in reality circles or slightly eccentric ellipses.

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[14] Amer. Jour. Sci., Feb., 1893, p. 105.

[15] H. Rosenbusch: Mikroskopische Physiographie der petrographisch wichtigen Mineralien, Stuttgart, 1892, pp. 712, Fig. 239, etc.

[16] Comptes Rendus, Vol. cxv, p. 830.

[17] Duboin, Bull. Soc. Franc. d. Minn., Vol. xv, p. 191.

[18] Bull. Soc. Franc. d. Minn., Vol. xv, p. 237.

A new machine for cutting and grinding thin sections of rocks and minerals, with stored electricity as the motive power, is described by G. H. Williams[19].

Rock Separations.—Thallium-silver-nitrate [$Tl\ Ag\ (NO_3)_2$], according to Retgers,[20] is an excellent medium for the separation of mineral grains of great density. The double salt fuses at 75°, and in the fused condition is clear and mobile. In this condition its specific gravity is 5, and this may easily be lowered by the addition of water. Its manipulation is simple. A small beaker containing the solid salt is placed in a water bath and heated. Upon its liquefaction the powder to be separated is added and the mixture is allowed to stand for a short time. As soon as a layer of clear liquid forms between the precipitated and the floating grains the beaker is plunged into cold water. The salt thus consolidates rapidly. The beaker is now broken and the heavy grains are collected by scraping and washing.

A new method of separating the constituents of rock powders, whose densities are above 2.60, has been devised by Dafert and Derby.[21] The principle involved is the suspension of small particles in gentle currents of water. The apparatus necessary for the operation is fully described by the authors. Separation is not complete between powders of nearly the same density, but there is a strong concentration of the heavier and the lighter ingredients in the two resulting portions of the separated material.

[19] Amer. Jour. Sci., Feb. 1893, p. 102.

[20] Neues Jahrb. f. Min., etc., 1893, Vol. I, p. 90.

[21] Proc. Roch. Acad. Sci., Vol. II, p. 122.